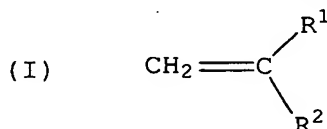


WE CLAIM:

1. A reaction product of reactants, wherein the reactants comprise:  
a) at least one copolymer comprising at least 30 mol % of  
5 residues having the following alternating structural units:



wherein DM represents a residue from a donor monomer, AM represents a residue from an acceptor monomer, at least 15 mol % of the copolymer comprising a donor monomer having the following structure (I):



10

wherein  $\text{R}^1$  is linear or branched  $\text{C}_1$  to  $\text{C}_6$  alkyl,  $\text{R}^2$  is selected from the group consisting of linear, cyclic or branched  $\text{C}_1$  to  $\text{C}_{20}$  alkyl, alkenyl,  $\text{C}_6$  to  $\text{C}_{20}$  aryl, alkaryl and aralkyl, at least 15 mol % of the copolymer comprising an acrylic monomer as an acceptor monomer; the copolymer containing pendant

- 15 carbamate groups or groups that can be converted to carbamate groups;

b) at least one aldehyde; and

c) at least one monohydric alcohol;

wherein when the copolymer (a) contains groups that can be converted to carbamate groups, the reactants further comprise:

- 20 d) at least one material that will convert said groups into carbamate groups.

2. The reaction product of claim 1, wherein the donor monomer is one or more selected from the group consisting of isobutylene, diisobutylene,  
25 dipentene, and isoprenol optionally in combination with styrene, substituted styrenes, methyl styrene, substituted methyl styrenes, vinyl ethers, vinyl esters, and vinyl pyridine.

3. The reaction product of claim 1, wherein the donor monomer of structure I is selected from the group consisting of isobutylene, diisobutylene, dipentene, isoprenol, and mixtures thereof.

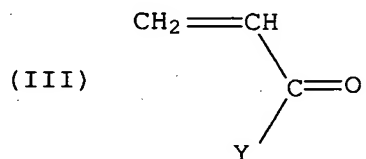
5 4. The reaction product of claim 1, wherein the group  $R^2$  of the donor monomer of structure I contains hydroxyl functionality.

5. The reaction product of claim 1, wherein the acceptor monomer comprises one or more described by the structure (II):



wherein W is selected from the group consisting of linear or branched  $C_1$  to  $C_{20}$  alkyl and alkylol.

6. The reaction product of claim 1, wherein the acrylic monomer is one or more described by structure (III):



wherein Y is  $-\text{OR}^4$ , and  $R^4$  is linear or branched  $C_1$  to  $C_{20}$  alkyl, alkylol or carbamoyl alkyl.

20 7. The reaction product of claim 6, wherein Y includes at least one hydroxyl group or carbamate group.

8. The reaction product of claim 1, wherein the copolymer has a molecular weight of from 250 to 100,000.

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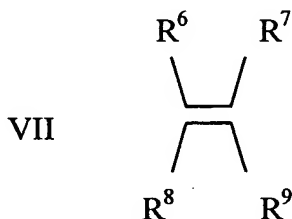
9. The reaction product of claim 1, wherein the copolymer has a polydispersity index of less than 4.

10. The reaction product of claim 1, wherein the alternating structural units comprise at least 50 mol % of the copolymer.

11. The reaction product of claim 1, wherein the acceptor monomer  
5 is one or more selected from the group consisting of hydroxyethyl acrylate, hydroxypropyl acrylate, 4-hydroxybutyl acrylate, 2-carbamoyloxyethylacrylate, and 2-carbamoyloxypropyl acrylate.

12. The reaction product of claim 11, wherein the acceptor  
10 monomer is 4-hydroxybutyl acrylate.

13. The reaction product of claim 1, wherein the copolymer comprises one or more residues derived from other ethylenically unsaturated monomers of general formula VII:



15

wherein R<sup>6</sup>, R<sup>7</sup>, and R<sup>9</sup> are independently selected from the group consisting of H, CF<sub>3</sub>, straight or branched alkyl of 1 to 20 carbon atoms, aryl, unsaturated straight or branched alkenyl or alkynyl of 2 to 10 carbon atoms, unsaturated straight or branched alkenyl of 2 to 6 carbon atoms substituted with a  
20 halogen, C<sub>3</sub>-C<sub>8</sub> cycloalkyl, heterocyclyl and phenyl, R<sup>8</sup> is selected from the group consisting of H, C<sub>1</sub>-C<sub>6</sub> alkyl, and COOR<sup>10</sup>, wherein R<sup>10</sup> is selected from the group consisting of H, an alkali metal, a C<sub>1</sub> to C<sub>6</sub> alkyl group, and C<sub>6</sub> to C<sub>20</sub> aryl.

25 14. The reaction product of claim 13, wherein the other ethylenically unsaturated monomers are one or more selected from the group consisting of (meth)acrylic monomers and allylic monomers.

15. The reaction product of claim 1 wherein the groups that can be converted to carbamate groups are hydroxyl groups and (d) is a carbamate-containing material that is reactive with the hydroxyl groups.

5           16. The reaction product of claim 15 wherein (d) is methyl carbamate.

17. The reaction product of claim 1 wherein the aldehyde is formaldehyde.

10

18. The reaction product of claim 1 wherein the monohydric alcohol is selected from at least one of methanol, ethanol, n-propanol, isopropanol, n-butanol, isobutanol, and cyclohexanol.

15           19. The reaction product of claim 1 wherein the copolymer is substantially free of maleate monomer segments and fumarate monomer segments.

20           20. The reaction product of claim 1 wherein the copolymer is prepared in the absence of Lewis acids and transition metals.

21. The reaction product of claim 1, wherein said reaction product has an equivalent weight of from 125 to 3000, based on etherified carbamate functional groups.

25

22. A curable composition comprising the reaction product of claim 1.

23. A curable composition comprising:  
30           a) the reaction product of claim 1 and

b) at least one material having functional groups that are reactive with the reaction product of a).

24. The curable composition of claim 23, wherein the reaction  
5 product a) is present in an amount of 1 to 99 percent by weight based on the total weight of resin solids in the curable composition.

25. The curable composition of claim 23, wherein the material b) is  
present in an amount of 1 to 99 percent by weight based on the total weight of  
10 resin solids in the curable composition.

26. The curable composition of claim 23, wherein the material b)  
has functional groups selected from the group consisting of hydroxyl,  
methanol, methanol ether, carboxylic acid, amide, thiol, urea, carbamate,  
15 thiocarbamate, and mixtures thereof.

27. The curable composition of claim 26, wherein the material b) is a  
polymer selected from the group consisting of acrylic, polyester, polyether and  
polyurethane polymers including mixtures thereof.

20

28. The curable composition of claim 23 wherein the material b) is  
an aminoplast.

29. The curable composition of claim 27, further comprising at least  
25 one auxiliary crosslinking agent different from a) and b), present in amounts of 1 to 50 percent by weight based on total weight of resin solids in the curable composition.

30. The curable composition of claim 29, wherein the auxiliary  
30 crosslinking agent is selected from at least one of polyisocyanates; triazine compounds of the formula:  $C_3N_3(NHCOXR)_3$ , wherein X is nitrogen, oxygen,

sulfur, phosphorus, or carbon, and R is a lower alkyl group having one to twelve carbon atoms, or mixtures of lower alkyl groups; and aminoplasts; and the material b) has functional groups that are reactive with the auxiliary crosslinking agent.

5

31. The curable composition of claim 30, wherein the auxiliary crosslinking agent is a polyisocyanate, and wherein at least a portion of the isocyanate groups are capped.

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32. The curable composition of claim 27 wherein the material b) is an acrylic polymer.

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33. The curable composition of claim 27, wherein the material b) is present in an amount of 1 to 50 percent by weight based on the total weight of resin solids in the curable composition.

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34. The curable composition of claim 33, wherein the material b) is present in an amount of 1 to 35 percent by weight based on the total weight of resin solids in the curable composition.

25

35. The curable composition of claim 32, wherein the acrylic polymer is present in an amount of 20 to 85 percent by weight based on the total weight of resin solids in the curable composition.

36. The curable composition of claim 32, wherein the acrylic polymer has hydroxyl functional groups.

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37. The curable composition of claim 26, further comprising an additional polymer different from the material b), selected from acrylic polymers, polyester polymers, polyurethane polymers, and mixtures thereof.

38. The curable composition of claim 37, wherein the additional polymer is present in an amount of up to 30 percent by weight based on the total weight of resin solids in the curable composition.

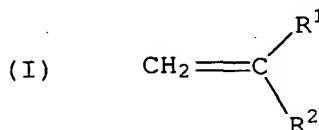
5 39. The curable composition of claim 38, wherein the additional polymer is a polyester polymer.

40. A copolymer comprising at least 30 mol % of residues having the following alternating structural units:

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wherein DM represents a residue from a donor monomer, AM represents a residue from an acceptor monomer, at least 15 mol % of the copolymer comprising a donor monomer having the following structure (I):



15 wherein R<sup>1</sup> is linear or branched C<sub>1</sub> to C<sub>6</sub> alkyl, R<sup>2</sup> is selected from the group consisting of linear, cyclic or branched C<sub>1</sub> to C<sub>20</sub> alkyl, alkenyl, C<sub>6</sub> to C<sub>20</sub> aryl, alkaryl and aralkyl, at least 15 mol % of the copolymer comprising an acrylic monomer as an acceptor monomer; the copolymer containing pendant groups of the structure:

20



where R' is alkyl containing one to eight carbon atoms and R'' is selected from H, CH<sub>2</sub>OR', linear, cyclic or branched C<sub>1</sub> to C<sub>20</sub> alkyl, alkenyl, C<sub>6</sub> to C<sub>20</sub> aryl, alkaryl and aralkyl.

25

41. The copolymer of claim 40, wherein the donor monomer is one or more selected from the group consisting of isobutylene, diisobutylene, dipentene, and isoprenol optionally in combination with styrene, substituted styrenes, methyl styrene, substituted styrenes, vinyl ethers, vinyl esters, and vinyl pyridine.

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42. The copolymer of claim 40, wherein the donor monomer of structure I is selected from the group consisting of isobutylene, diisobutylene, dipentene, isoprenol, and mixtures thereof.

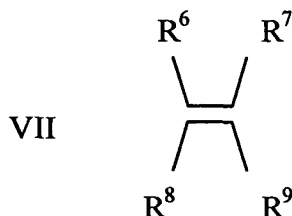
5 43. The copolymer of claim 40, wherein the copolymer has a molecular weight of from 250 to 100,000.

44. The copolymer of claim 40, wherein the copolymer has a polydispersity index of less than 4.

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45. The copolymer of claim 40, wherein the alternating structural units comprise at least 50 mol % of the copolymer.

15 46. The copolymer of claim 40, wherein the copolymer comprises one or more residues derived from other ethylenically unsaturated monomers of general formula VII:



wherein  $R^6$ ,  $R^7$ , and  $R^9$  are independently selected from the group consisting of H,  $CF_3$ , straight or branched alkyl of 1 to 20 carbon atoms, aryl, unsaturated straight or branched alkenyl or alkynyl of 2 to 10 carbon atoms, unsaturated straight or branched alkenyl of 2 to 6 carbon atoms substituted with a halogen,  $C_3$ - $C_8$  cycloalkyl, heterocyclyl and phenyl,  $R^8$  is selected from the group consisting of H,  $C_1$ - $C_6$  alkyl, and  $COOR^{10}$ , wherein  $R^{10}$  is selected from the group consisting of H, an alkali metal, a  $C_1$  to  $C_6$  alkyl group, and  $C_6$  to  $C_{20}$  aryl.

20

25



47. The copolymer of claim 46 wherein the other ethylenically unsaturated monomers are one or more selected from the group consisting of methacrylic monomers and allylic monomers.

5 48. The copolymer of claim 40 wherein R<sup>1</sup> is selected from at least one of methyl, ethyl, n-propyl, isopropyl, n-butyl, isobutyl, and cyclohexyl.

49. The copolymer of claim 40 wherein the copolymer is substantially free of maleate monomer segments and fumarate monomer  
10 segments.

50. The copolymer of claim 40, wherein said copolymer has an equivalent weight of from 125 to 3000, based on etherified carbamate functional groups.

15

51. A curable composition comprising the copolymer of claim 39.

52. A curable composition comprising:

a) the copolymer of claim 39 and  
20 b) at least one material having functional groups that are reactive with the copolymer of a).

53. The curable composition of claim 52, wherein the copolymer (a) is present in an amount of 1 to 99 percent by weight based on the total weight  
25 of resin solids in the curable composition.

54. The curable composition of claim 52, wherein the material (b) is present in an amount of 1 to 99 percent by weight based on the total weight of resin solids in the curable composition.

30

55. The curable composition of claim 52, wherein the material (b) has functional groups selected from the group consisting of hydroxyl,

methylol, methylol ether, carboxylic acid, amide, thiol, urea, carbamate, thiocarbamate, and mixtures thereof.

56. The curable composition of claim 55, wherein the material (b) is  
5 a polymer selected from the group consisting of acrylic, polyester, polyether  
and polyurethane polymers including mixtures thereof.

57. The curable composition of claim 55 wherein the material (b) is  
an aminoplast.

10

58. The curable composition of claim 52, further comprising at least  
one auxiliary crosslinking agent, different from a) and b) present in amounts of  
1 to 50 percent by weight based on total weight of resin solids in the curable  
composition.

15

59. The curable composition of claim 58, wherein the auxiliary  
crosslinking agent is a polyisocyanate and the polymer has functional groups  
that are reactive with the polyisocyanate.

20

60. The curable composition of claim 59, wherein the auxiliary  
crosslinking agent is a polyisocyanate, wherein at least a portion of the  
isocyanate groups are capped.

25

61. The curable composition of claim 56 wherein the polymer is an  
acrylic polymer.

62. The curable composition of claim 56, wherein the polymer is  
present in an amount of 1 to 50 percent by weight based on the total weight of  
resin solids in the curable composition.

30

63. The curable composition of claim 62, wherein the polymer is present in an amount of 1 to 35 percent by weight based on the total weight of resin solids in the curable composition.

5           64. The curable composition of claim 61, wherein the acrylic polymer is present in an amount of 20 to 85 percent by weight based on the total weight of resin solids in the curable composition.

          65. The curable composition of claim 62, wherein the acrylic  
10 polymer has hydroxyl functional groups.

          66. The curable composition of claim 56, further comprising at least one additional polymer different from the polymer b), selected from acrylic polymers, polyester polymers, polyurethane polymers, and mixtures thereof.  
15

          67. The curable composition of claim 66, wherein the additional polymer is present in an amount of up to 30 percent by weight based on the total weight of resin solids in the curable composition.